TASK 2

Describe the logistic regression model. The answer should be comprehensive. The practical example with data and the
python code are mandatory. Place your answer into the task2.pdf file. The source code and the data should be included
in the resulting pdf file. No additional files are required.

ANSWER:

Logistic regression is a statistical method used for binary classification problems, where the dependent variable (target) is categorical and has only two possible outcomes. It predicts the probability that a given input belongs to a certain category based on one or more independent variables.

1. Logistic Function (Sigmoid Function): The logistic regression model uses the logistic function to model the probability that a given input belongs to the positive class. The logistic function is defined as:
   p(X) = 1 / (1+e^-z), where p(X) is the probability of the positive class, X represents the input features, and z is the linear combination of the input features and their corresponding weights
2. Linear Combination: Similar to linear regression, logistic regression also involves a linear combination of the input features and their corresponding weights, but instead of directly predicting the outcome, it predicts the probability of the positive class.
3. Decision Boundary: The decision boundary separates the instances belonging to different classes. In binary classification, the decision boundary is typically a straight line when there is only one feature, or a hyperplane when there are multiple features.
4. Maximum Likelihood Estimation (MLE): The logistic regression model parameters (weights) are estimated using the maximum likelihood estimation technique, which maximizes the likelihood of observing the given data under the assumed logistic distribution.

PRACTICAL EXAMPLE:

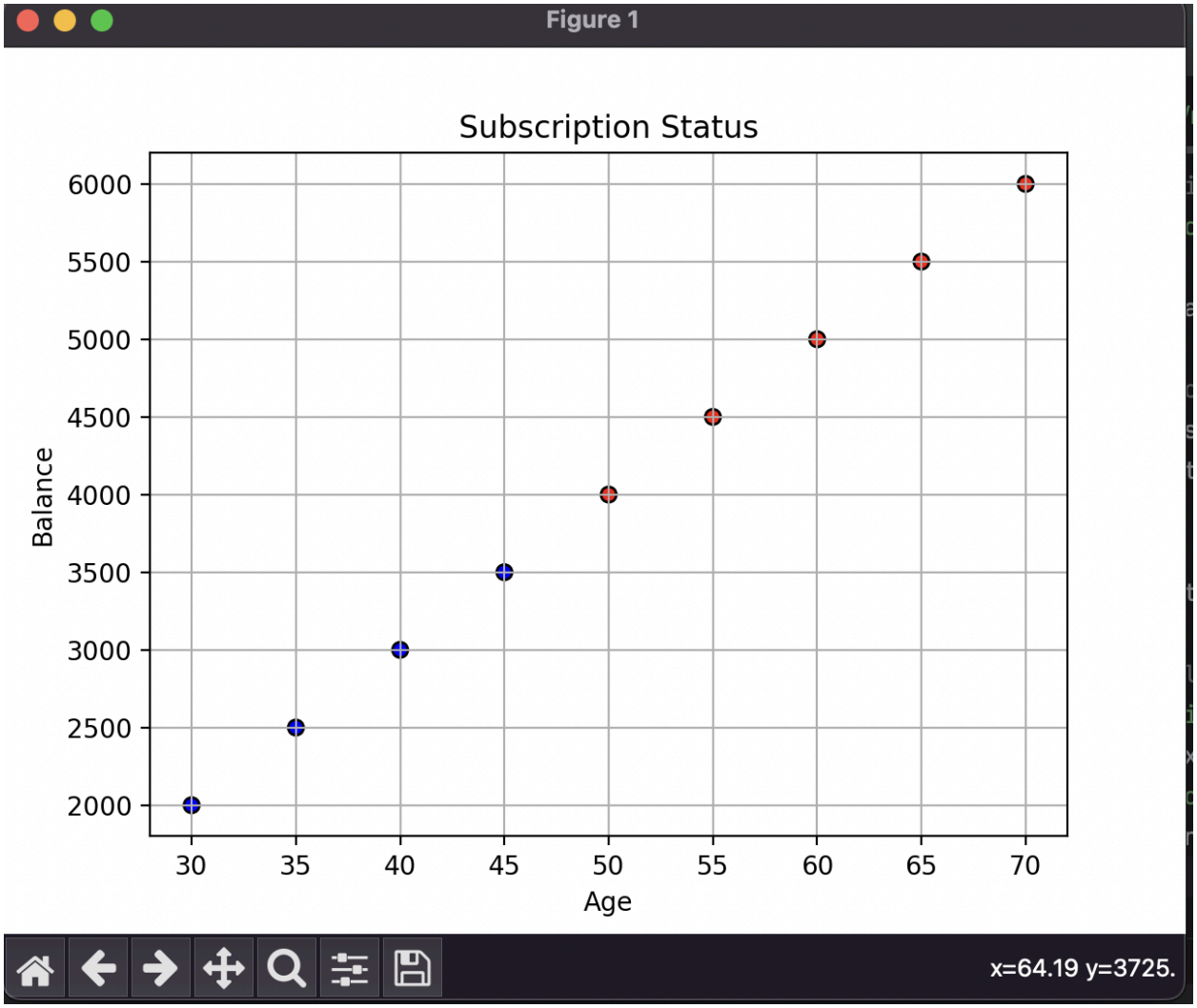
Figure 1
Subscription Status
Balance
6000
5500
5000
4500
4000
3500
3000
2500
2000
30
35
40
45
50
55
60
65
70
Age
x=64.19 y=3725.

```
Confusion Matrix:
[[1 0]
 [0 1]]

Classification Report:
              precision    recall  f1-score   support

           0       1.00      1.00      1.00         1
           1       1.00      1.00      1.00         1

    accuracy                           1.00         2
   macro avg       1.00      1.00      1.00         2
weighted avg       1.00      1.00      1.00         2


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